Things to Know, Understand and Do
For Chapter 4: Electronic Structure

By the end of Chapter 4, you should

Know how to…
Use the terms, *wavelength, frequency, speed* of waves to describe wave behavior
Understand that the energy of a photon, a massless particle of radiation. This is an extension of Plank's idea that energy at the atomic level is quantized
Describe origin of light from excited atoms, its relationship to atomic structure and how Bohr's atomic model accounts for the emission line spectra of excited hydrogen **and** why it does not work in an atom with 2 or more electrons.
Understand that, in the Bohr model of the H atom, the electron can occupy only certain energy levels. Also how electrons can jump from energy level to energy level, absorbing and releasing energy.
Describe experimental evidence for and concept of particle-wave duality.
Recognize significance of quantum mechanical model of atomic structure.
Describe the shapes of the s, p, and d orbitals and identify the types that exist
Write the electron configurations, orbital notations, electron dot notations (full and shorthand) for atoms in their ground and excited states as well as monatomic ions.
Using the periodic table as a guide, write electron configurations and draw orbital energy diagrams, recognizing paired and unpaired electrons.
Recognize the electrons are assigned to subshells of an atom in order of increasing subshell energy in many electron atoms. (the ns orbital fills before the (n-1)d orbital.)
When assigning electrons to atomic orbitals, apply the Aufbau principle, Hund's rule, and the Pauli exclusion principle.

understand…
Rutherford's model of the atom and the two reasons why it was wrong.
Planck's work with heating metals, his findings, and how energy comes in discrete amounts (quanta).
How the Bright Line Spectrum of an element is created.
Bohr's model of the hydrogen atom, and how he was right and wrong
deBroglie's X-ray diffraction experiment and how it showed wave-particle duality
How the quantum model is similar and different than Bohr's model
Heisenberg's Uncertainty Principle
Understand how an orbital for an electron in an atom corresponds to both the allowed energy of that electron.
Understand that the position of an electron is not known with certainty (Heisenberg Uncertainty Principle); only the probability of an electron being at a given point in space can be calculated (this is the orbital in which it may be located)
That the Pauli exclusion principle lends to the conclusion that no atomic orbital has be assigned more than two electrons and that the two electrons in an orbital must have opposite spins.